AN ASSESSMENT OF SOCIAL CRISIS ARISING FROM WATER POLLUTION IN GBARAMATU REGION OF DELTA STATE

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CERTIFICATION

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DEDICATION

This project work is dedicated to the Lord God Almighty, for seeing me through in this research work.

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ABSTRACT

The research was focused on water pollution induced by social crises, water samples were collected and analyzed using four communities in Gbaramatu region in Delta State as a case study. The goal was to examine the role of social crises and as regards to water pollution in the study area. Methodology involved collection of water samples from different locations to determine the quality of the water in four communities under study. Three of the sites are impacted or polluted areas while the fourth is the control site with less history of social crises. Results shows that most of the impacted environment reveals adverse pollution in the waters. Targeted parameters include; Temperature, which ranged between (27 – 28 ºC), pH level, range from 4.1- 5.5), Total Dissolved Solid in water (TDS), range 1938 (300)Mg/l, Turbidity 60.0 (NTU), Salinity 1400 (600)CL, Total Organic Carbon in soil 0.84-0.74(mg/kg), BOD 2.14 (4.0-10.00)mg/l, COD 320 (10.0)mg/l Total Hydrocarbon Content. (THC) 784 (10.0) mg/l, Oil and Grease Content 1246 (10.0-20.0)mg/l. The determination of heavy metal concentrations were carried out with a wide digestive hot plate for heavy metals analysis. The concentrations exceeded the Federal Ministry of Environment Standards of Safe Environmental. Overall results showed pollution impact within study area and were statistically presented in Histogram and they reveal adverse environmental impact. Recommendations were suggested to promote safe environmental ethnic, tolerance and peaceful co-existence in order to minimize social crises posed pollution in study area.

Keywords: Conflict, Gbaramatu, Health, Resolution, Social crises, Water pollution.

CHAPTER ONE

INTRODUCTION

1.1 Overview

Crisis is a stage in a sequence of event at which the trend of all future events especially for better or for worse , is determined.

Social Crisis and conflicts have been a clog on the wheel of economic growth and development and its effects are very devastating. The effects of social crises include; environmental pollution and degradation t underdevelopment, unemployment etc.

Crisis is a condition of instability or danger as in social economic, political or international affairs leading to a decisive change. Social crises could be corrupting as ethno-religious war, genocide or politically induced, the end result of crises is destruction of properties, natural resources depletion etc. (Schiechtle and Ristern 1997).

Though the region or study area is blessed with natural and human resource, however it is always experiencing one crises or the other because of ethnic disagreements and political power.(Medwell Journal, 2012)

Most environmental problems in the modern world today have their origin in the rapid population growth. And the quest to achieve a better standard of living. Man has always influenced his environment and has also been influenced by the environment (Efford, 1975).

Moreover, the management of natural resources which are components of the environment and how to promote sustainable use of renewable environmental resources, should be the benchmark, rather than getting involved in special inappropriate behaviors caused by actual and perceived injustice by government and oil companies. These are the major cause of crises in the region resulting into environmental pollution.

Pollution is an unfavorable alteration of the environment largely by the activities of man (Egborge, 2OO4). The ecosystem is continually being degraded by an ever-expanding effect of crisis in the study area. Just as Urbanization and industrial growth are essential for the economic development, so is protection the natural environment and the ecosystems necessary for the conservation biodiversity. We therefore needs a balance between economic development and environmental conservation processes which is referred to as sustainable development.(Bhatia, 2001).

The natural environment undergoes continues changes even in the absence of man, but these changes may be on a time scale of hundreds of years as with continues drift and mountain building up with natural euthrophication process, a situation where shallow lakes or river gets filled up over the years. These Natural changes are irreversible, as the annual climatic cycle transient (Kapoor 2000).

According to Chapman(2000), superimposed changes on the natural environment are those which are manmade or anthropogenic. Man's increasing 'control' on his environment often creates conflicts between human goals and the natural

processes. In order to achieve greater yields or for other purposes, man deflects the natural flow of energy, by-passes natural processes, sever food chains and simplifies eco-systems. In some cases, these activities may create surroundings that man considers desirable nevertheless, conflict often arises between strategies that maximize short-term gain. Such as fighting over proposed project and destroying the site making it unfit for the project anymore thereby relocation of the project which was supposed to be beneficial to the community. These actions poses a penalty of irreversible environmental resource depletion to the communities involved. This is because very little or no consideration is given to economic calculations such as, slow soil deterioration, depletion of an aquifer, or accelerated euthrophication of large water bodies. Dash: (1999).

Recent studies revealed that Crises erupts almost daily as a result of unbridled corruption, among community leaders' and government officials including company representatives, political instability and poor economic management in the side of government and top government functionaries, including other issues of unemployment and eventually, this crises often results in gross environmental pollution because of the deliberate destruction of oil installations (Eni 2005).

Environmental pollution increases with population increase, urbanization and industrialization. Considering the years before oil exploration and exploitation activities began, the rural indigenes could just go to any nearby river fishing and within few hours he is back home with enough fish and crab for the daily foods.

Today in the era of oil exploitation and civilization, it is a different ball game, no one even think of fishing activities anymore.

By physical observation, fumes and, bobbles of oil are seen on the water surfaces and oil stains on leaves and stems of plants in the mangrove forests.

Contamination of the environment by the effect of incessant crises posed oil pollution has created significant health threat to the quality of life and the environment of the study area. In fact, the prevalence impact levels of some heavy metals pollution revealed that the aquatic ecosystems is in great danger of death and extinction. The consequence of such is abject poverty, and increased criminal activities in the study area.

1.2 STATEMENT OF PROBLEM

There is very little or no economic growth and development in the study areas as a result of the devastating effects of incessant social crises in the region. Of cause no meaningful investor will invest in a restive environment.

Environmental degradation is known to be the deterioration of the environment through the depletion of the natural resources and the destruction of the ecosystem resulting in the extinction of some species aquatic species.

The presence of oil industries in the study area and their activities are contributing factors to the incessant social crises leading to pollution and degradation of the region. The fight for who will represent which community and what community is the host so as to get more stake on the company.

1.3 AIM AND OBJECTIVES

AIM

This study is geared towards investigating the effect of social crises posed pollution on the water environment, in the Gbaramatu region of Warri Delta State.

OBJECTIVES

The objectives of the study were as follows:

1. To identify and analyze the concentration of environmental parameters the in water (rivers) of the study area as a result of inorganic elements and toxins in explosives discharged into the waters during social crises.
2. To Compare the concentrations of the analyzed elements in the water environment of the study area with regulatory safe environmental standards
3. To make recommendations in conformity with statutory national and international standards of environmental quality control end safe environment standards.

1.4 SCOPE OF STUDY

This research is limited to water pollution associated with social crises in the four communities of Gbaramatu area of Delta State. The analysis focused on some environmental parameters which includes; Temperature, pH, Salinity, Alkalinity,

Turbidity, Oil and Grease Content, Chemical Oxygen Demand, (COD), Biochemical Oxygen Demand (BOD), Dissolved Oxygen (DO), Total Dissolved Solid (TDS), Total Hydrogen Content (THC), Total Carbon Content (TCC) and some heavy metals such as Cadmium, Copper, Zinc, lead and Chromium.

1.5 SIGNIFICANCE OF STUDY

The significance of this study cannot be overemphasized, especially in the face of increasing urbanization and industrial development in the study area.

Consequently, the results drawn from this study could serve as a means to take up the responsibility of avoiding actions or inactions that can pose social crises or any form of restiveness or conflict among neighboring communities.

Provide guideline in environmental and social decision making especially in resolving and managing social crises. Within the years, no thorough academic investigation has been carried out to ascertain the long term effect of incessant social crises resulting major environmental pollution problem. Therefore, this project work is an attempt to access the extend of water pollution caused by social crises in the study area.

CHAPTER TWO

LITERATURE REVIEW

2.1 THE CONCEPT OF THE ENVIRONMENT

The concept of the environment is broad and very complex, it is sometimes used interchangeably with the surrounding; it is therefore an all encompassing and

inclusive terms embracing all living and non living entities of the globe including man, his social, economic, political and cultural activities. It also represents the physical dimensions. Akhionbare (2009)

Therefore, the word environment embraces the biological elements and all media susceptible to pollution such as water, air, soil or land, plants and animal (flora and fauna), human beings, urban and rural conservations, land scopes and building. Splhaus: (1998).

The socio-economic aspect of the environment also includes: the political structure, labor market demography, education, housing, health, police, fire services etc. while the cultural aspect includes the life style of the people in question, the quality of life, social problems, communities structure and conflicts region etc. the temporal dimension tells us that the environment can change with time. It shows that an environment is never static but dynamic. However, the occurrence of an activity or event can facilitate the change of an environment. There are indications to show that there is a growing change of heart on environmental issues, because no responsible and honest person can deny the fact that there is linkage between environmental degradation juvenile delinquency, restiveness and poverty, neither will anyone deny the fact that health and general well being are interwoven with a safe environment.

However, the fact remains that there is an increasing awareness of the long and short term effect on the impacts of juvenile delinquency and environmental degradation as inhibiting sustainable development. We shall therefore join hands

together to fight against possible re-occurrence of such depleting events. (Hussmann 2011).

The environment has been defined by different authors and expatriates in different perspectives. The environment include our surrounding which also includes the air (atmosphere), water(hydrosphere), oil (lithosphere) and the living entities (biosphere). It can therefore be defined as the sum total of all social, economic, biological, physical and chemical factors constituting the surrounding of man. When the environment on earth was formed, both the evolutionary processes and ecological factors combined to create a complex organism like human beings, who began to dominate and regulate the environment.

Population explosion and rapid industrial development has led to the release of various types of contaminants and pollutants into the aquatic environment.

The environment has been differently defined by different authors to include man, his social, political, physical, economical, biological, cultural attributes of life.

The environment can also be seen as a total surrounding of an organism, which includes the physical surrounding, non-living factors and living organisms. For example, the environment of a maize plant in the farm includes:

The soil and the surrounding atmosphere , The climate, such as rainfall, temperature, sunlight, relative humidity and wind, living organisms within the soil, such as ants, earthworms, grasshoppers and rodents etc.(Naseema: 2002).

The environment of an organism is essential for its survival, in fact; all organisms depends partly on the non-living aspect of their environment for existence, and all organisms constantly interact with the living and non-living (biotic and A biotic) components of their surrounding or environment. A fish in the stream constantly obtains oxygen from the water and gives back carbon dioxide. It obtains food from its surrounding water, (stream and River) and passes out waste products into the environment, it may be eaten by predators and if the stream dries up it may migrate or die.

All organisms thus has a wide and interesting range of inter-relationship with its environment. This situation is applicable to man as the highest organism of the world, we must therefore take good care of our environment, so as to avoid unhealthy conditions Nwazuwe: (1984)

2.2 ENVIRONMENTAL IMPACT (E.I)

Man's numerous activities on the environment has created various impacts on the environment, those resultant changes which takes place during and after an activity or event in an environment are referred to as environmental impacts, these changes occurs over a specific period and within a defined area. (Daniel and Mathew, 2000).

Impact therefore, refers to changes (adverse effects or impacts) that results from or as a result of the establishment of a project or activity in an environment,

Environmental impacts may be in any of the following forms;

Physical and socio-economic, Direct and indirect, Short term and long term, Adverse and beneficial, Qualitative and quantitative, Actual and perceived impacts.

Environmental impacts may as well be local (site of project, village or town level) and may go beyond boundaries and localities to regional, national, and even to International binderies. Impacts are in some cases with special dimension (spread of the impact), it can spread beyond immediate boundaries of local to regional, national and even international (Unwana, 2012).

Some impacts are irreversible such as the conversion of a fertile land into a housing estate, the land is lost from fertility forever, on the other hand some are reversible. A reversible impact for example, if a river was polluted as a result of oil and gas activates and the company or oil activities stopped functioning in the area, the river (which was polluted) will naturally and gradually re-gain its normal pure state through the natural purification process. This is a natural elimination of toxicant in the river (Kapoor, 2000).

Actual environmental impacts are obvious and are felt by everybody in the area ,for example, the sudden change in the coloration of a river resulting from discharge of effluent from nearby oil servicing companies into river or stream is an actual impact on the immediate environment.

On the other hand, perceived impacts are subjective and depend on perceptive capabilities of individuals for example, it's not everybody

that may be able to perceive that there are changes in roofing sheets (roofing sheets turns reddish) in color due to the impact of acid rain (Medwel, 2012).

Environment impacts may be adverse and beneficial, quantitative and qualitative, short term and long term respective. For example a sanitary land fill in an environment will not only produce nuisance or bad smell, but many also produce leach ate that may infiltrates into the underground water which will eventually get polluted (i.e. an adverse effects sanitary land fill project may also create jobs opportunities its sited in an area of high unemployment (positive or beneficial impact). Depending on the size of the land fill. These various impacts may last for a short term period or may persist for a very long time (Naseema, 2002).

Environmental impacts occur in a chain like manner, with initial impacts leading to other impacts. An initial influence, change our impact in an environment creates a set of triple effects which leads to direct and indirect impacts. The chain can have steps. Direct impacts are also referred to as primary impact while indirect impacts are secondary impacts (Dhamdja *et al*., 2002).

Environmental impacts are dynamic, change occurs with time in position and dimension for several years until a stable condition is reached. We know from our definition that the environment includes

both physical, social, health economic and other variables. It is therefore certain that any impact (adverse effect on the environment) can also attract the variables (Dhamdja *et al*., 2002).

For instance the physical variables or factors of the environment which includes the climate, rainfall, temperature, humidity, topography, water body etc. has a lot to do in the life of man and other living organisms in an environment. This is inter connected with the livelihood of the people, and their social life which includes the community population, groups and human rights, migration, birth rate and death rate, level of education, life expectancy, infrastructures utilities such as water, electricity, housing status and crime rate etc. Environmental impact has so much to do in the existence and sustenance of life. Canter: (2000)

2.3 ENVIRONMENTAL POLLUTION

Pollution is a natural or induced change in the quality of the environment (air, water and land quality) which renders it unsuitable or dangerous for food, human and animal's habitation (Daniel, 2000).

Pollution is also seen as the subjection of the resilience and stability of ecosystem to serious environmental stress due to the intensity of human disturbance (Medwel,2012). However, Akpede, (1999) defined it as the release of substance or energy into the environment by man in the

quantity which are harmful to him and other component of the environment thereby reducing the quality of life.

This therefore means that pollution entails an undesirable change in the physical, chemical or biological characteristics of the environment (air, water and soil) that may species, our industrial processes, living conditions, and cultural assets or that may or will pose harmful effects on life and other species of organisms. This implies the introduction of substances, which makes the environment abnormal in comparison with its natural, undisturbed initial state (Philip, 2008).

2.4 Water Pollution

Water pollution may be defined as the presence of impurities in water in such quantity and of such nature as to impair the use of the water for a stated purpose. Thus, this definition of water quality is predicated on the intended use of water, and a gross determination of quality of suspended and dissolved imparities, while useful in some cases, is not enough to completely define water quality.

Water in nature is most nearly pure in its evaporation stage. Because the very act of condensation usually requires a surface or nuclei, water may require imparities at the very moment of condensation. Additional impurities are added as the liquid water travels through the remainder of the hydraulic cycle and comes into contact with materials in the air and on or beneath the surface of the earth. Human activates contribute further imparities in form of industrial and domestic wastes agricultural chemicals and other less obvious contaminants. Ultimately, these

impure waters will complete the hydrologic cycle and return to the atmosphere as relatively pure water molecules. (Holden: 1976)

However, it is water quality in the intermediate stage, which is of greatest concern because it is the quality of this stage that will affect human use of water. The impurities accumulated may be both suspended and dissolved from throughout the hydrologic cycle. Suspended materials consist of particles larger than molecular size that are supported by buoyant and viscous forces within water. Colloids are very small particles that technically are suspended but often exhibit many of the characteristics of dissolved substances size and range of dissolved, colloid and suspended substances varies from 10^{8}mm – 10^{-1}mm. The test analysis of sediments and water shall explain it better in chapter 3 of this research work (Sethi, 1998).

Other Aspects of Water Pollution includes: (a) Physical Pollution of Water which is the pollution of water which brings about the physical changes of the water such as color change, odor, density, taste, turbidity and thermal properties etc. (b) Chemical Pollution of Water is due to the presence of inorganic and organic chemicals such as acids, alkalis, toxic organic compounds, dissolved inorganic compounds and dissolved organic compounds. The chemical pollution of water causes changes in acidity, alkalinity or Hp, dissolved oxygen (DO) and other gases in water. This may be caused by organic pollutant or inorganic pollutants, degradable or non bio de gradable as the case may be. (c) Biological pollution of water

is cause by the presence of pathogens in water which include bacteria, fungi viruses, protozoa and parasitic worm etc. The important source of bacteriologic and pollution are domestic sewage and industrial wastes. Solid excreta from human bodies and decomposable organic matter of sewage are the best medium for the development of bacteria in water. (d) Physiological pollution of water is caused by several chemical group agents such as chlorine, sulphur dioxide, hydrogen sulphide phenols and hydroxyl benzene. Water pollution may be categorized into 5 groups based on the sources. They include: ground water pollution, Surface water pollution, Lake water pollution, River water pollution and Sea water pollution,

For the purpose of this study, our attention will be on River/sea water pollution, because of the area of study. However, the major pollutants of water are: Sewage and domestic wastes, Industrial activities and affluent, Agriculture (fertilizers), Detergents and Toxic metals etc. (Soemarwoto: 1974)

But our interest here is on industrial activities and effluent which include pollution by oil spillage and chemicals.

River, lakes and sea water pollution has been most over emphasized due to increasing population, industrialization; urbanization has posed a serious threat to these vast varieties of water resources. Nkwocha (2004)

Ocean cover more than two third of the earth's surface and they play a crucial and important role in the chemical and biological balance of life on the planet.

Marine pollution is defined as the discharge of waste substances into the sea, river or lake resulting in harm to living resources, hazards to human health, hindrance to fishery and impairment of quality for use of sea water, marine pollution is associated with the changes in physical, chemical and biological conditions of the river/sea water. This water is also unfit for human consumption and purpose because of high salt content (Daniel *et al*., 2000).

Water pollution by oil spill is the greatest damage to water it endanger the aquatic life in the surface layers and also the Coastal flora and fauna. One drop of petroleum spreads over a great area to isolate the water from contact with atmospheric oxygen.

Water is the most abundant and wonderful natural resource, is extremely essential for survival of all living organisms. But today clean water has become a precious commodity and its quality is been threatened by numerous sources of pollution which includes; Sewage and domestic waste, industrial effluents, Agricultural discharge, Fertilizers, Detergents, Toxic metals, Siltation, Thermal pollution, Radioactive metals and Crude oil spillage.

2.5 Effects of water pollution

We cannot afford to ignore the environmental consequences of development and industrialization which are already apparent particularly in the oil industry sectors which have damaging effect on the environment. We shall lay more emphasis on water pollution because water (river, creek and the sea) stands as one of the major means of livelihood to the people of this area of study.

Crude oil exploration and production is a major industries development which has played a major role in the socio-economic structure of this region of Delta State, yet it has so much negative environmental consequences or impacts on this very delicate and sensitive terrine and the mangrove ecology which serves as an important means of livelihood. Apart from oil pipeline vandalization during crises, some other production processes of crude oil by servicing companies also poses potential environmental impacts in their Production processes such as:

Drilling process which involves accumulation of toxic materials and courses Oil pollution in the sea, beaches and land which also courses destruction of aquatic and terrestrial organisms, alternation of taste of fishes, killing of bottom dwellers, and pollution of underground water. Akhionbare: (2008)

The health effect of Water pollution is characterized by nausea, vomiting, diarrhea and weakness etc. The Effect of water pollution can also destroy biological immune system (body becomes less resistant towards a variety of diseases) *it* can also cause somatic and genetic disorders, gene mutations and blood abnormalities in human beings and consequently death (Bisong, 2001).

The effects of heavy metals pollution in water includes chronic and acute poisoning, and damage to the kidney and then creates avenue for cancer attack and gastric and intestinal disorder, disease of the heart and liver. Other effects are irritation of eye, nose and throat and damaged of the lungs producing edema and bronchioles. Symptoms includes, Coughing and shocking, Inflammation

Headache , Sleepiness, Eye pains, Damage of body cells and tissues, Cancer of the eyes and lungs, Poisoning of the central nervous system, Skin irritation

Damage of mucus membrane.

Other effects of water pollution to be considered is the socio – economic effect. A polluted river, stream, or lake and sea can affect the following socio-economic/ cultural activities which include; Fishing and crabbing inhibition, Bating, sailing and water skiing, Swimming, water games, parks, Camping picnicking, Field trips, nature hikes (educational), Decreased value of facility utilization because of aesthetics and**,** Loss of future use of water resources in the case of surface and ground water.

2.6 Social Crises

The main cause of social crises in the study area is conflict which is a condition of or situation of contention and an encounter of irreconcilability or incompatibility between two parties over access to control .

Conflict as a result of social crises creates grate disputes, disagreements, quarrel, struggles and fight between the communities in the study area. Conflicts involves the use of verbal attacks or of arms in a struggle and it subsequently generates to warfare, social disorganization and disharmony.

The major causes of crises and conflicts in the study area remains the struggle to control boundaries and the limited resources revenue in the region, creation of local government areas and their headquarters locations, etc,

2.7 The environmental effects of social crises

The effects of crises con never be over emphasized, crises leaves very devastating effects on men and his environment ranging from massive lost of lives and properties including major oil installations, lose of man hours and investment opportunities, hunger and starvation, hindrances to development and can also graduate into full flesh open violence war of mass strikes and other forms of disruptions.

Crises also is a major threat to human health this begins from the various traumatic events of crises which can cause physical limitations and chronic medical conditions.(UNFPA 2001)

Crises creates vast quantities of debrircks and rubbles in the environment at the detriment of human life and major ecosystems. Toxins are released into the environment which in turn gets into the system of man through food chain and bio accumulations. The half-life of toxin is between 7-11years, that is why it settles on major body organs until the concentration increases to the degree of killing its host. Toxins emits as a result of the use of explosives and burning of properties and items containing herbicides and insecticide which are not environmentally friendly (Lincoln2007),

2.8 Occasions of crises in the study area

Occasions of crises recorded in the study are includes; crises as a result of the creation of Warri South West LGA placement of local government headquarters and relocation of same, lingered from 1916-1998 this crises kept coming up subsequently up till 2006.

The most traumatized occasion was 2009 between militants and JTF, when shootings and bombing including air strikes were conducted on the communities living thousands of individuals caught at crossfire. This incident repeated in Nov. 2010, and then the initiation and establishment of the Federal Maritime University in Okerenkoko erupted another major crises from 2013 till 2018 and there are still resentments till date.

In nature there are various kinds of biodiversities which also includes fungi, bacteria and other micro-organisms, that are constantly at work to break down organic

compounds but the quest arises when pollution is on the increase, who, when what and how to do the clan up of the polluted environment since the quality of life is inextricably linked to the overall quality of the environment, global attention has

been focused on the ways to sustain and preserve the environment. This endeavor will only be possible by getting everyone involved and applying all types of technology including Biotechnology.

An excellent solution that may be applicable in the environmental issues are those which avoids environmental problems from the starts. Therefore if the principle to avoid, reduce and dispose of waste is strictly followed by only very few or no environmental problem would occur. Thus not many environmental engineers and biotechnologist would be required to obtain a quality environment. Although nature has an enormous potential to recycle materials and energy. This potential and the special biological processes canbe applied in the chemical industries to recycle and treat wastes, effluent or wastewater, and off gases, thus reintegrated the man-made, synthetic chemicals into the natural cycles.

Environmental considerations have been ignored or neglected in development planning in most developing counties like Nigeria, exploitation of natures resources without due care to its repercussions could lead to the disruption of social harmony due to the loss of human life etc.

No doubt, technological development of industrialization is the life line of developing counties; current choice of technology that could minimize negative impact on the environment and enhance the quality of life is a necessity that is affordable by developing counties like Nigeria.

Corrective action or measures can be more costlier than preventive measures. Moreover, consideration to the environmental aspects of development requires not only the monetary cost-benefit, but also an impact assessment to look into the environmental effects.

Environmental management system is also a good policy measure of management action, operating procedures, documentation and record keeping with defined responsibilities and accountability of persons within an organization. There has been a tremendous change in people's attitude and awareness towards the environment. Therefore, people are more concerned about the deteriorating condition of their environment. The greatest damage to water is inflicted by petroleum and its products which endangers the aquatic life in the surface layers and also the coastal flora and fauna. One drop of oil or petroleum product can spread over great area to isolate the water from contact with atmospheric oxygen. Water pollution can pose serious threat to plant and animals when present in minute quantities.

Water pollutants can be classified as degradable (either rapidly or slowly) or non-degradable water pollution can result from natural runoff, dissolved chemicals in water that percolates through the soil, agriculture, mining activities, industry ,construction, homes and business, industrial effluents discharged into water bodies containing toxic chemicals, hazardous compounds, like phenols, aldhydes, ketones amines, cyanides, metallic wastes, plasticizers toxicant, acids,

corrosive alkalies, oil and grease, dyes, biocides, suspended solids, increase in water temperature from the numerous industries discharges etc.

The natural environment plays a very important role in the life style and the socio-economic aspect of man Particularly if there is a hornets desire to keep an environment regenerating, when the resources can continue to sustain the growing population and to the future generation.

However the delicate balance between the competing demand on the natural environment is imposing an ever growing threat. The economy is adversely impacted upon and the health and wellbeing of the people is threatened as well as the soil structure, alongside with the effects of crises and restiveness.

While the need to protect the natural environment and the yarn for sustainable development is indisputable, we cannot achieve this without a proper investigation of the initial and essential curses of the problems of this region as discussed above. An environmental protection scenario therefore cannot be possible on its own, rather it has to be an integral part of a strategy that shall focus on striking a balance between economic growth and environmental conservation objectives through this kind of research work.

The intention for this write up therefore, is to initiate strategy for rural development, agricultural intervention accompanied by other aspects of treasured that can enhanced community life through useful suggestion and recommendations to tackling the causes of low economic growth and environment resources depletion and environmental degradation.

Finally, it is apparent that in the early years after independence, environmental protection did not receive attention, though there was little awareness such that,

- Government agencies were armed with legal and executive powers to intervene only when necessary.
- The need of the hour is for consciousness and awareness for harmonizing population dynamics and social economic development and harnessing of

natural resources with due care to see that quality of the environment does not deteriorate as the duties of citizens are spelt out in unambiguous language.

- Despite plethora of environmental legislation, the degradation still continues.

The goal of a remediation efforts is to limit the extent of contamination and to prevent further deterioration of the environment by preventing crises prone activities and participates in proper dialogue to attain a memorandum of understanding among companies and host communities.

The world commission on environment and development produced a document on "care for earth: A strategy for sustainable living". This document defines and explained the concept of sustainable development. According to this report, the environmental development conflict is more apparent than real. As poverty is the worst enemy of the environment, it's alleviation requires human intervention on natural ecosystem during the course of development. At a minimum, the sustainable development must not endanger the natural ecosystem.

CHAPTER THREE

METHODOLOGY

3.1 STUDY AREA

The Gbaramatu region between latitude of 40^{o} to 50^{o}Eand between longitude 60^{o}to 70^{o}N in the southeastern part of delta state, Nigeria. The region comprises of Izon speaking communities and Itsekiri neighboring communities which made up about 20% of the population of Delta State. The inhabitants of this region are people with almost the same traditional ethics and cultural norms and believe, about 70% of the people are illiterates and are living below poverty level.

The Gbaramatu region is noted for its peculiar and difficult terrain. The whole area is traversed and crisscrossed by a large number of Rivulets, streams, canals and creeks. The costal line is buffeted throughout the year by the tides of the Atlantic Ocean while the mainland is subjected to regimes of flood by the various seasonal rivers.

The region is rich in natural resources, including crude oil, Timber and mangrove forest, It also has large oil and gas reserves.

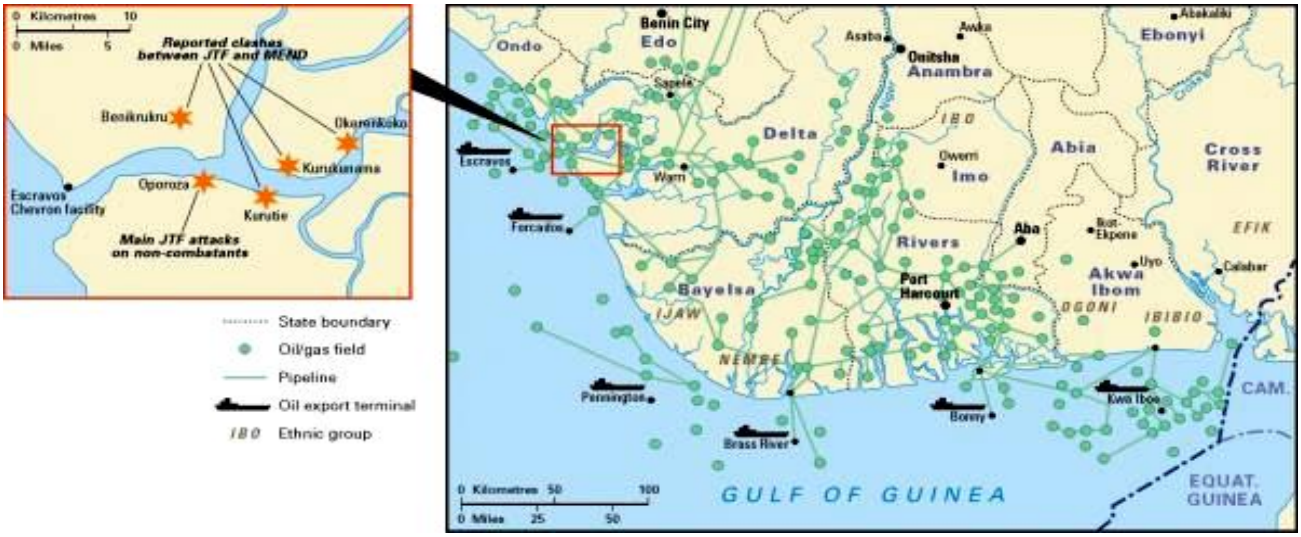

Fig 3.1: Gbaramatu Region in Warri South West Local Government of Delta State.

This study area is noted to have witnessed crises resulting from environmental degradation which led to destruction of infrastructures. Health indicators are lagging behind national average, while other infrastructures such as Medicare facilities, schools and other social amenities are very poor condition.

The region attracts a lot of oil servicing companies off shores and on shores. Some of these include Shell Petroleum Development Company (SPDC), Chevron Nig. Ltd, Texaco Overseas, Tidex, Globster, Slumberger etc. These companies' daily activities result in pollution with its negative environmental consequences.

Temperature across this region is relatively high with a very narrow variation in seasonal and diurnal rages (22^0C – 36^0C). There are basically two seasons, wet season which last from April to October, and the dry season which commence with harmattan, a dry cloudily spell that last till February and it is associated with low temperature and a dusty and hazy atmosphere brought about by the North – East wind. In line with the

rainfall distribution, a wetter south climate that comes with particular species of fish called Bonga fish. The tropic evergreen rainforest belt bears timbers and mangrove forest, there is also an average production of food cash crops enough to satisfy their immediate community demands and for minimal export.

3.2 Research Design

This research is experimental (field experiment). Samples were collected from four communities within the region of study, they are Oporoza (location.I), Okerenkoko (location.2), Tabizor (location.3), Benikuruku. (location.4). The water samples were collected with bottles for laboratory analysis. Other methods of analysis include; the physical observation of the waters (river) in the environment and personal interview methods which also helped in the data collection of relevant information for the research work. Information (data) were also obtained from already existing facts and statistics of related issues that has accrued in the region.(family history books, culture books, journals and internet).

3.3 Water Quality Analysis

3.2.1In situ determination of Temperature , pH, Salinity and Dissolved Oxygen (DO).

The HORIBA U-10 water quality checker was used to determine pH, water Temperature, Dissolved Oxygen and Salinity electrometrically in situ. The meter is calibrated with the standard phthalate calibration solution and the desired physicochemical parameter read off the LCD of the meter. Total dissolved Solid

(TDS) was also determined in situ electrometrically with HACH conductivity meter (Model CO 150) with an inbuilt automatic TDS and values recorded directly in mg/l from the display screen.

3.4 Laboratory Analysis:

General Apparatus/Material Used in Laboratory

Laboratory apparatus used to carry out the lab analysis includes: Beakers, Tray, Measuring cylinder, Analytic balance, Retort stand, Filter paper, Funnel, Volumetric flask, Oven, Reagent Spectrophometer, pH meter, Burette, Conical flask,Water samples and Sample containers bottle.

3.5 Determination of Turbidity

Apparatus used in determining the water turbidity level includes; Turbid meter, (Hanna, model 400se, 1999)

Procedure used is the America society for testing and material (ASTM), (ALPHA 214) method (as recommended by DPR and the federal ministry of environment).

Before use, the instrument was turned on and it was allowed to warm up in the 0.1000 NTU range for at least 30 minutes before being used. A clean sample cell with the solution to be measured was raised with a small amount of sample to guide against contamination of sample by dust or residue in the sample cell. The sample was filled with approximately 25ml of test sample. Then the outside of the c ell was dried with clean linen-free cloth or tissue. Care was taken to make sure the bottom of the cell is

clean and dry. Thereafter, the sample cell was inserted into the cell chamber and records value or measurement was taken. As recorded in the table.

3.6 Determination of Total Hydrocarbon Content (THC)

Apparatus used to determine the concentration of (THC) Includes; centrifuge, spectrophotometer and separating funnel.

Procedure: A known volume of sample was collected and poured into a separating funnel and 50ml of xylene was added, shake and allowed to stand or settle. Then the xylene was drained into a measuring cylinder. Another 40ml of xylene was added into the separating funnel and agitate vigorously. Step one and two were repeated.

Finally, 10mls of xylene was added into it and allowed to settle then drained out the extracted solvent (xylene). Centrifuge for 15 minutes our out the filtrate into a clean 100ml beaker and scoop 1.0g of silica gel (chromatography reagent) for THC and add to the solution. Stir it again with magnetic stirrer for 30 seconds, allow to cool for 1-5 minutes and filter, absorbance form the spectrophotometer at 425nm was given.

Calculation:

$$\frac{\text{Mg/1 abs x malefactor x volume of extracted solvent}}{\text{Volume of sample used}}$$

Result = mg/l.

3.6 Determination Of Salinity (Cl^-)

Apparatus: Burette, conical flask, measuring cylinder:

Method: APHA 4500

Procedure: Measured 10ml or 50ml (a known m1 of sample) into a conical flask, if the samples were highly colored add 3ml A1 (OH)3 suspension, mix it and allow to settle and filter. Then titrate sample in the PH range of 7-10 directly. Add 1m1 (3-4drops) of K_2CR0_4 indicator solution and stir. Titrate with standard Agitate to get a punkish yellow end point. Be consistent in end point recognition.

Calculation

$$\frac{Mg1c = A-BxNx35.5x1000}{\text{Volume of sample}}$$

Where

A=m1 used for titrating sample

B = m1 used for titrating blank

N = Normality of Ag No_3

3.7 Determination Of Biochemical Oxygen Demand (BOD)

Apparatus : incubator, incubator bottles, measuring cylinder, Burette , conical flask, beaker

Method: BOD_5 or 5-day BOD test

Procedure: preparation of dilution wanton was placed in a suitable bottle and 1ml of each of the following reagents were added, phosphate, buffer, magnesium, sulphate, calcium chloride and iron (iii) chloride solution.

The dilution water was then stored in an incubator at a temperature of 20^0c +- 1^0c measures a suitable volume of sample and pour it into a beaker, the dilution water was added into the sample and stirred. The BOD bottle was filled to the brim and a stopper inserted without leaving any air bubble inside.

The initial dissolved oxygen (D0) was therefore determined immediately and the sample was incubated for 5 days at 20^0c before the final Do will be determined. The difference between the initial Do and the final Do is the BOD determination of the sample

calculation.

$$\frac{\text{BOD 5mol (1 = Dob – Doa – Dosb – Dosa)}}{\text{DO}}$$

Where D = dilution factor

Dob = DO of the sample before incubation

Doa = DO of the sample after incubation

Dosb = DO of sample blank before incubation

Dosa = DO of sample blank after incubation.

3,8 Determination Of Oil And Grease

The extraction solvent used for this experiment was tri- chlorotrifloro ethane, sample was carefully transferred to a separating funnel and sample bottle was rinsed with 30 ml of solvent washed and added to the funnel and shaken vigorously for 2 minutes and allowed to settle in separated layers. Than a small portion of the lower part of the

solvent was drained through a funnel with filter paper and 10g of Na_2SO_4 which has been solvent rinsed was added into a clean 100ml volumetric flask . extract twice with 30ml of solvent at a time and sample container was rinsed with each portion of solvent, .then combine the extraction in a volumetric flask and a final rinsing of filtrate and Na_2SO_4 with an additional 10-20ml of solvent was added in flask. The final volume was adjusted to 100ml with solvent the a stock solution of known oil was prepared by rapidly transferring about 1ml of (0.5-1.0g) of oil of grease to a tarred 100ml volumetric flask. Flask was stopper and weighed to the nearest milligram. Solvent was added to dissolve and diluted to mark. A pair of matched near – infrared silica cell was selected . a 1cm-paht –length cell is appropriate for working range of about 4-40 mg. standards and samples were scanned from 3200cm-1 to 2700cm-1 with solvent in the reference beam and result recorded on absorbance paper .absorbance sample and standard was measured by constructing a straight base line over the scanned range and nearing absorbance of the peak maximum at 2930cm-1 and subtracting base line absorbance at that point.

Calculation;

$$\text{Mg oil and grease} = \frac{A \times 100}{\text{Mg Sample}}$$

Where A =mg of oil or grease in extract as determined from calibration curve.

3.9 Determination Of Heavy Metals (Ni, Cd ,Zn, Pb, Fe).

Apparatus :Beaker, volumetric flak and measuring cylinder, Hot plate.

Procedure: the determination of Ni, Pb, Zn, and cadmium was carried out by a wild digestion of the sample on a hot plate for heavy metal, analysis the samples were acidified with $NH0_3$, there after a 100ml of well mixed sample was transferred to a beaker, 5ml of distilled and 1:1 HCL was added to it and was heated using a steam bath until the volume was reduced to 15-20ml, the pH of the sample was adjusted to pH according to it analytical method by drop wise addition of 5.0N sodium Hydroxide standard solution. The sample was quantitatively transferred to a mark with demineralized water. The values for each of the metal ready were recorded directly from the data logging spectrophotometer.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 RESULTS

The level of the environmental quality parameters measured across the four sampling points Physicochemical analysis are shown in appendix 1, wide variation was observed in the quality of the determined environmental parameters as against the regulatory standards of the Federal Ministry of Environment (FMEvn) and DPR. Standards such as PH range =4.11-5.6 (6.5-9), Temperature range = 27 above (25.0)0C, Salinity range =1400 (CL)mg/l (600) (CL)mg/l, Dissolved Oxygen (DO) range =1.22 (6.0)mg/l, Total Hydrogen Content (THC) range = 7.5 (10.0)mg/l,

Total Dissolved Solid (TDS) range = 19381 (200-300)mg/l, Turbidity range =60.0 (15.0)nu, Chemical Oxygen Demand (COD) range = 3.20 (10,0) mg/l, Oil and Grease content range =1245 (10-20)mg/l.

Table 2 : River Water sample analytical Test Result

Parameters	Concentrations					
	Values of Loc1	Values of Loc2	Values of Loc3	Values of Loc 4	Average value of FME/DPR	Average value of study area
Ph	5.14	5.17	4.90	5.20	6.5-9.0	5.11
Temperature ^{0}C	27.1	28.2	27.10	27.9	25.0	27.6
Total dissolve Solid (TDS) mg/1	913.0	109.0	700	500	200-500	800
Oil & Grease content mg/1	124.5	131.2	125.6	125.5	1.0-20.0	126.7
Turbidity (NU)	60.0	60.1	58.2	60.0	15mg/l	59.60
Dissolve Oxygen mg/1	1.22	2.00	1.18	1.20	6.0	1.40
Total hydrocarbon content mg/1	78.5	78.2	76.8	80.0	10.0	78.4
Salinity (CL)mg/1	140.0	140.0	139.0	140.7	60.0	139.9
Alkalinity mg/1	6.11	6.20	6.80	6.12	N/A	6.31
Biochemical oxygen demand (BOD_5) mg/1	2.14	2.15	2.14	2.25	4.0-10.0	2.17
Chemical oxygen Demand (COD) mg/1	32.0	38.2	35.0	33.0	10.0	34.6
Vanadium mg/1	0.01	0.01	0.01	0.01	N/A	0.01
Led mg/1	0.10	0.10	0.10	0.10	1.5mg/l	0.10
Total iron mg/1	88.5	80.9	86.4	88.2	1.0mg/l	86.0
Copper mg/1	11.4	12.2	11.0	11.2	1.5-2.0	11.45
Zinc mg/1	30.0	30.0	28.0	30.0	1.5-5.0	29.5
Cadmium mg/1	0.1	0.1	0.04	0.61	0.20	0.060
Chromium mg/1	0.10	0.1	0.1	0.1	0.20	0.1

Source: Analytical lab. Field work

The waters sample were used to determine and analyze the concentrations of the following Environmental parameters.‘ pH, Temperature ^{o}C, Total Dissolved solid (TSD) mg/1, Oil and grease content mg/1, Turbidity (NTU), Dissolved Oxygen

mg/1, Total Hydrogen content, mg/1, Salinity (l) mg/l, Alkalinity mg/l, Biochemical Oxygen Demand (COD) mg/1, vanadium mg/l, Lead mg/1, Total iron mg/1, Copper

mg/l, zinc mg/l , Cadmium mg/1, Chromium mg/l as stated in the table above to compare with the values of permissive regulatory standards.

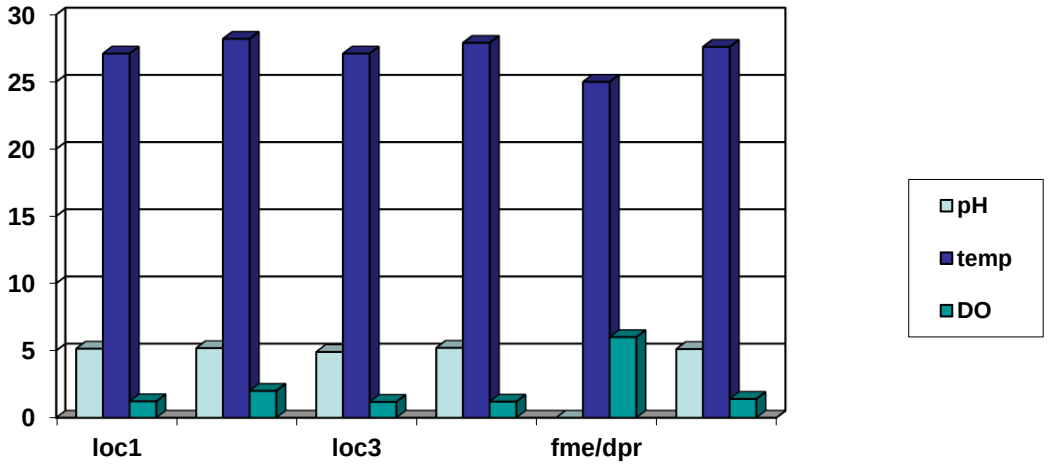

Fig. 4.1: The graphical presentation of the variations for Temperature, pH, and Dissolved oxygen

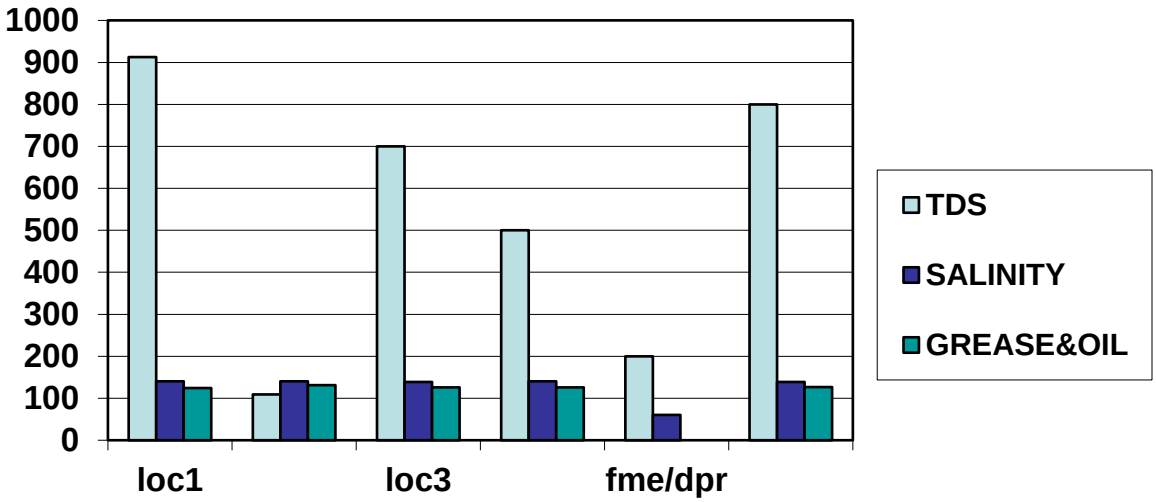

Fig. 4.1: The graphical presentation of the variations for Total Dissolved solid (TDS) salinity, Grease & oil..

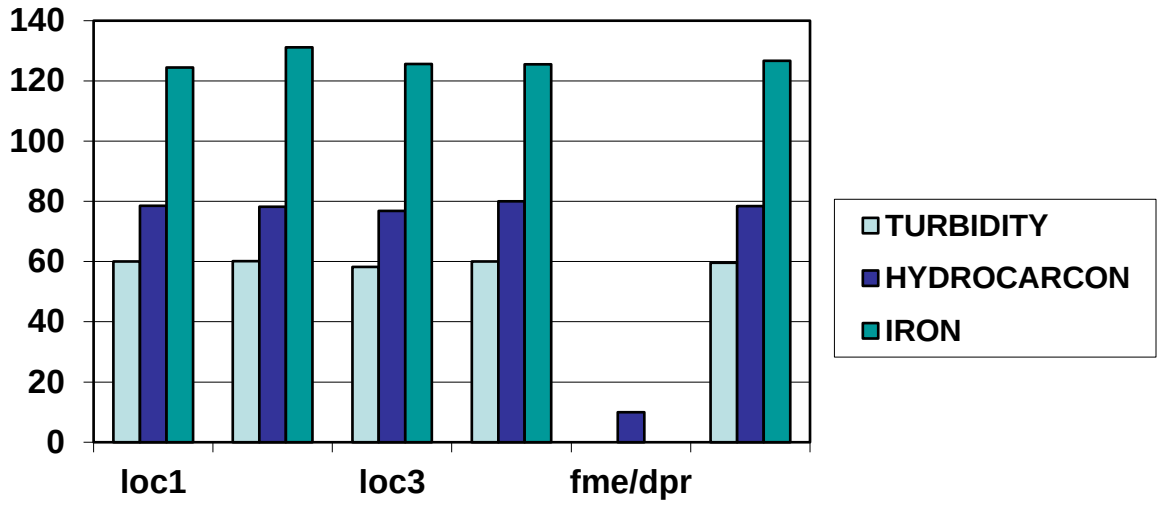

Fig. 4..3 The graphical presentation of the variations for Turbidity, Hydrocarbon (THC) and Total Iron.

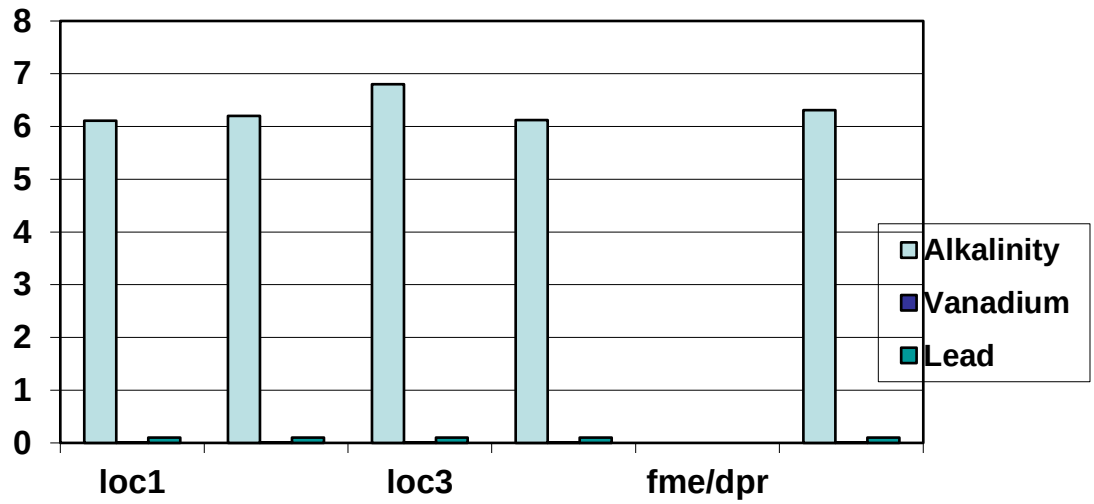

Fig. 4.4: The graphical presentation of the different variation of Alkalinity, Vanadium and Lead (pd)

The result above indicated that the lead content is very high above permissible value and DPR limits, lead is a hazardous element to living organism especially Man.

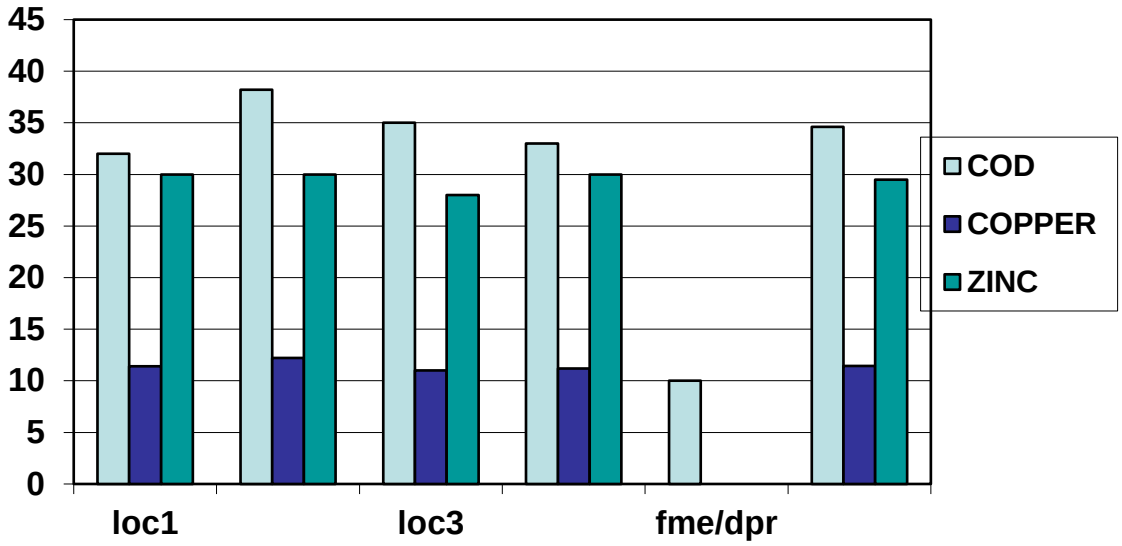

Fig 4.5.Graphical representation of the variations of chemical oxygen demand, copper and zinc (heavy metals)

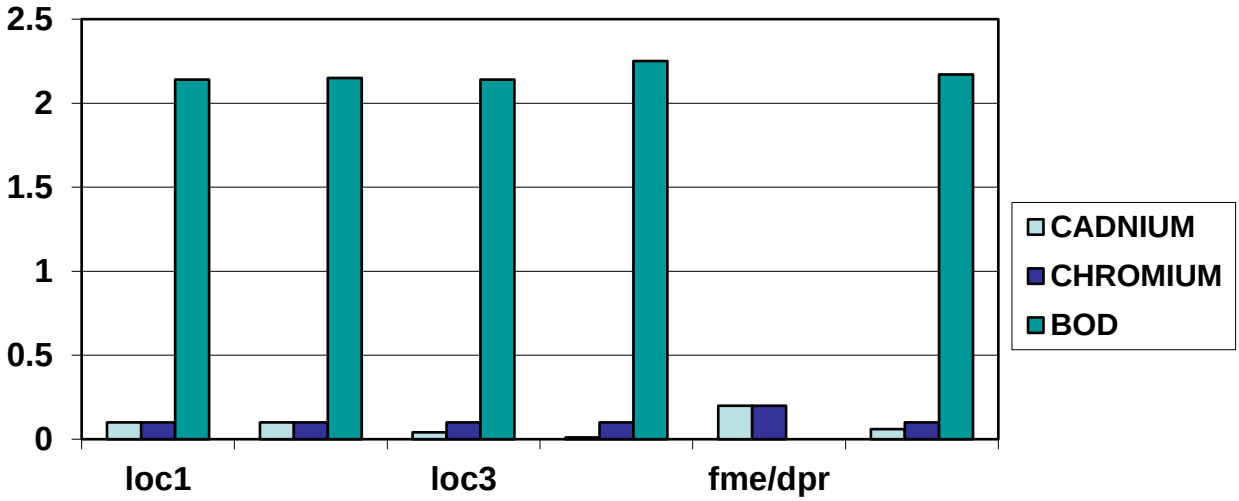

Fig. 4.6: The graphical presentation of the difference in variations of Cadmium, Chromium and Biochemical Oxygen demand.

4.2 DISCUSSION

In the light of the above analytical, result showed that all the parameters analyzed in the different samples such as temperature, total Dissolved solid (TDS), oil and grease content, turbidity (NTU), DO, BOD, COD etc and heavy metals contents etc. analyzed were all above the federal ministry of environment standard and the DPR permissible limit.

The pH values showed non-compliance because of the frequency of social crises effect on the environment (water). The high volume of TDS is also as a result of incessant crises. The pH values as shown in the result above is the same range across the aquatic environments, the soil/ sediment and vegetation. They are all result is between the acid line (4.11- 5.8)mg/l in the pH scale, which indicates that the environment is acidic as a result of the frequent incidents of pollution problem across the entire region.

The Biochemical Oxygen demand (BOD)values of 2.14mg/1 is very low and below the DPR standard limit of 10.0mg/1 and Federal .Ministry of Environment limit of (4.0-5.0)mg/l because of the continuous oil fumes on water, surface thereby preventing the aquatic life of oxygen by staving them to death.

The salinity and turbidity values also exceeded the Federal Ministry of Environment (FME) limit due to high concentration of salts from consistent contamination or pollution of the river waters and influx of turbid run-off from the surrounding environment, since everywhere is polluted with crude oil.

Cadmium and Chromium are relatively high above intervention value. Except that of the sediment value which is minimal at (1.2)mg/l and (0.20)mg/l, respectively.

The heavy metals which includes lead, cadmium, chromium iron etc, showed non-compliance with their respective values of exceeding the standard limit. This showed a clear indication that the entire river water environment in the area of study is highly impacted upon negatively and needs a quick intervention.

The above result on Chemical Oxygen Demand showed no positive environmental impact on the points of sampling and the surrounding environment. In addition, to the light of the above result illustration for zinc tested no positive impact on the environment (water, soil and sediment) since the values of all the tested parameters indicates higher values ranging from (3.0 – 20) mg/l, higher than permissible values of(1.0- 5.0) mg/l. The concentration of copper present in the environment also shows high negative impact.

The total hydrocarbon content (THC) showed a high value (78.4)mg/l as a result of the hydrocarbon content in the environment, because of frequent crude oil spillage in the environment. Also, as illustrated above there is a high value of total iron content in the environment which has negative impact on the environment

The high value of Total Dissolved solid in water (TDS) is also a result of a

very high concentration of dissolved salts in the aquatic environment this is capable of increasing water turbidity and will consequently endanger aquatic life.

Temperature is high above FEPA limit. This gives rise to increase in biochemical oxygen demand, because increase in temperature is equal to decrease in dissolved oxygen (DO). This is at the detriment of aquatic ecosystem and also soil organism which helps in soil fertility.

Dissolved Oxygen (DO) value is very low, at (1.40)mg /l as against (6.0)mg/l shows that there is acute starvation of oxygen in the water (river) and the aquatic lives are in danger of suffocation onto death, this is the major reason why there is scarcity of fish and no more fishing activities and poverty level is increased in the area of study.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

There is pressure on the quality of the environmental (water) resources as industries, food, healthcare, vehicles etc become very necessary for the increasing population. But it is very difficult to maintain the quality of life by the achievement of a healthy environment with all these new development practices and all the necessities in place, if proper environmental management system is not applied.

Perceptions about the environmental impacts can be different from one country to another. An area where poverty is widely spread and large number of people do not have access to adequate food, shelter, health care education, and old age security, the lack of development may constitute a greater degradation of life quality than do the environmental impacts of development.

5.2 RECOMMENDATIONS

While it is clear that decisions will and should be made based on different value judgments concerning the net cost benefit assessment about environmental, economic, and social impacts, It is now widely accepted that development can be planned to make the best use of environmental resources and avoid environmental degradation to achieve environmentally sound and friendly development.

As an immediate measure, the oil companies should provide coping measures to assist the communities. Such measures will include provision of bore hole for water supply and palliative assistance in form of food supply. In the long term they should provide measures to clean up the environment damaged by their exploitation.

Precautionary principle should therefore be made to protect environmental degradations. It is therefore recommended that:

- the reduction of poverty is a pre-condition for environmentally sound and friendly development in lower income counties (areas)
- every human being is part of the community life and has the fundamental and equal rights to safely access environmental resources needed for a decent standard of living.
- Everyone would take responsibility for his impact on the natural environment, and should aim to share fairly the benefits and cost of resources use.
- Government and environmental policy makers should adopt strategies of the structural dimension of non waste technology which requires to be improved and should consist of a linking up of several different industries and their various activities in such a way that the waste of one industry can become a raw material for another. Such technology will rely on multiple use of resources and internal transfer of wastes from one section to become raw materials in another so as to prevent and or minimize waste, prevent pollution by rendering harmless the waste ultimately released into the environment.

- In case of thermal pollution, which is a usually thing to companies around the study area. Strict legislative measures should be taken to reduce or remove heat from the condensers.(Cooling waters and effluents before they can be discharged into water bodies), by the adoption of some of these measures. Cooling ponds, cooling waters etc. to cool or remove heat from effluent or waste waters to avoid thermal pollution.

    - Legislative measures should be enforced in order to adopt measures to also control soil or land pollution such as

i. Treatment of sewage and effluents before land disposal.

ii. Use carefully the fertilizers and pesticides preferable in optimal dose

iii. Preserve and protect top soil fertility by erosion control by proper tree plantation measures etc.

- EIA Decree should be strictly enforced. EIA act No. 86 of 1992 FEPA now Federal Ministry of environment as stated the steps to step follow up in EIA processes, from project conception to commissioning to ensure that it's implemented with maximum consideration to environment safety. Project steps like drilling operations (on shore and off shore construction) construction of crude oil production tank and pipelines,terminalfacilities, oil refineries and petrochemicals, hydrocarbon processing facilities etc.

- Taking proactive steps of environmental management will help address some environmental problems before they occur. The root causes of these environmental problems are tackled by minimizing the adverse consequences, otherwise, on the other hand, reactive environmental management only focus on "fighting the fire' instead of the source and the root cause of ignition to have been prevented beforehand.

- Due diligence: This is more than exhibiting a good safety attitude or simply following the legal requirement for preventing pollution. It

involves taking concrete steps to eliminate and control hazards (being proactive) such as taking up a comprehensive EIA study before the establishment of an industry etc. this could help prevent unwanted environmental problems including crises.

- Implementation of action plans for sustainable environmental management. This will basically take care of economic prosperity, environmental protection and social equity. A development that is able to meet the needs of the present generation without compromising the ability of future generation to meet their needs. A development that requires more efficient use of resources and finding ways to reduce damage and systematically track environmental incidents and prevent their reoccurrence.

Life is all about education, continues training and retraining to effect a positive change and renewing ideas. This is to enlighten the public about the importance of protecting and conserving the environment and the need to restrain human activities which lead to indiscriminate release of pollutant into the environment, education should start from the grass root level including children to the top. Public awareness is a synthesis of people's conceptions, interpretations and perceptions of environmental issues. It is assumed that such conceptions will affect the people's behaviors and the quality responses and reaction to environmental issue sand it will go a long way to enhance desirable environmental practices. Public awareness can create forum for dialogue and/or conflict resolution in environmental issues instead of crises. Public awareness will stimulate the 3p technology (pollution prevention pays) and give rise to public participation in pollution control.

- Contingency plan for pollution control and spill cleanup. This will help to achieve maximum environmental safety and protection. It will establish guidelines and provide procedures enabling the various levels of management to function efficiently and effectively when operations are

confronted with oil spill problems. It can help to prevent the escape of any further oil, contain the already spilled out, protect unaffected areas threatened by contamination, remove oil from the environment as effectively and efficiently as possible and ensure minimum ecological disruption and damage caused. Contingency plan is also associated with spill emergency response procedures to prevent or minimize environmental impacts

- There should be polices to enforce individuals and companies to be liable for their actions, so they will be conscious of their activities that pose environmental pollution. That is the **environmental liabilities policy** (EGPIN 2000).Unlike criminal laws, this policy do not require proof of criminal intention. An individual or company can be found guilty, even if they did not know their actions would result in a violation of the law. Disciplinary actions should be enforced.
- Nigeria should adopt the GLT technology (Turning Gas to Liquid) technology it will help to safe the atmosphere and the ozone layer. I think it will be economically and more profitable than flaring the gas.
- Government should enforce the environmental monitoring and assessment policies on ground to check indiscriminate actions of pollution. Available laws and regulations such as

1. Petroleum regulations 1967
2. Petroleum act 1969
3. Oil pipeline acts 1958
4. Oil in Navigable water acts o 34, 1968
5. Petroleum Drilling and production Amendment regulations 1973
6. Petroleum drilling and production regulation 1969
7. Environmental sanitation laws edicts

8. The Federal environmental protection agency (FEPA) Decree 58 of 1988
9. Factory Decree 1968

And other health and safety regulations.

Above all, government should recall the memorandum of understanding (MOU) of 1991 with oil industries which make provision for the achievement of it goals on the Niger Delta Region master plan, and the rapid industrial and commercial development, of which vision for the Niger Delta people can be accomplished which includes

1. That the Niger Delta area, must be transformed to a major industrial belt of world class standard that will be proud of rich culture, full of maturity , a tourism attraction cherished by its standard. (Niger Delta Development Commission Establishment act. 2000 act No 6) law of the Federal Republic of Nigeria.(Niger Delta Regional Master Plan, 2006).
2. That there should be assurance of gainful employment for qualified indigene. This will go a long way to reduce communal crises and environmental degradation occasioned by crises in the region.

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APPENDIX

Appendix 1 :TestAnalysis Result for water.

PARAMETER	FMEnv PERMISIBLE LIMIT	DPR LIMIT	RESULT
pH	6.5 -9.0	6.5-8.5	5.14
Temperature ^{0}C	25.0	25.0	27.1
Total dissolve Solid (TDS) mg/I	300	2000	19381
Oil & Grease content mg/I	10.0	20.0	1245
Turbidity (NTU)	N/A	15	60.0
Dissolve Oxygen mg/I	6.0	N/A	1.22
Total Hydrocarbon Content mg/I	10.0	10.0	785
Salinity (CL), mg/I	N/A	600	1400
Alkalinity mg/I	N/A	N/A	6.11
Biochemical oxygen demand (BOD_5) mg/I	4.0	10.0	2,14
Chemical Oxygen Demand (COD) mg/I	10.0	10.0	320
METALS			
Vandadum mg/I	N/A	N/A	<0.01
Lead mg/I	1.5	0.05	0.10
Total iron mg/I	1.0	1.0	88.5
Copper mg/I	2.0	1.5	11.4
Zinc mg/I	50.0	1.0	30.0
Cadmium mg /I	0.20	N/A	0.01

Note: FMEnv:= Federal Ministry of Environment, NA= Not Available.

APPENDIX 2: The Average Samples Analytical Result of the determination of Environmental Quality.

Parameters	Concentrations					
	Values for Loc1	Values for Loc2	Values for Loc3	Values for Loc 4	Average value of FME/DPR	Average values
pH	5.14	5.17	4.90	5.20	6.5-9.0	5.11
Temperature ^{0}C	27.1	28.2	27.10	27.9	25.0	27.6
Total dissolve Solid (TDS) mg/1	913.0	109.0	700	500	200-500	800
Oil & Grease content mg/1	124.5	131.2	125.6	125.5	1.0-20.0	126.7
Turbidity (NU)	60.0	60.1	58.2	60.0	15mg/l	59.60
Dissolve Oxygen mg/1	1.22	2.00	1.18	1.20	6.0	1.40
Total hydrocarbon content mg/1	78.5	78.2	76.8	80.0	10.0	78.4
Salinity (CL)mg/1	140.0	140.0	139.0	140.7	60.0	139.9
Alkalinity mg/1	6.11	6.20	6.80	6.12	N/A	6.31
Biochemical oxygen demand (BOD_5) mg/1	2.14	2.15	2.14	2.25	4.0-10.0	2.17
Chemical oxygen Demand (COD) mg/1	32.0	38.2	35.0	33.0	10.0	34.6
Vanadium mg/1	0.01	0.01	0.01	0.01	N/A	0.01
Led mg/1	0.10	0.10	0.10	0.10	1.5mg/l	0.10
Total iron mg/1	88.5	80.9	86.4	88.2	1.0mg/l	86.0
Copper mg/1	11.4	12.2	11.0	11.2	1.5-2.0	11.45
Zinc mg/1	30.0	30.0	28.0	30.0	1.5-5.0	29.5
Cadmium mg/1	0.1	0.1	0.04	0.61	0.20	0.060
Chromium mg/1	0.10	0.1	0.1	0.1	0.20	0.1

Source: Analytical lab. Field work

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